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(54) A SHAPING ARRANGEMENT

(71) We, SIEMENS AKTIENGESELLSCHAFT, a Germany company of Berlin and Münich, Germany (Fed. Rep.) do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:-

The present invention relates to a circuit arrangement, for interposing between a unidirectional voltage supply an an electrical device to be supplied with current.

According to the present invention there is provided a circuit arrangement for interposing between a unidirectional voltage source and an electrical device to be supplied with current, the circuit comprising first and second switching means and a voltage divider, arranged so that the switching path of the first switching means is connectable in series in the line between one terminal of the unidirectional voltage source and the electrical device to be supplied, and the voltage divider is connectable across the two terminals of the unidirectional voltage source, wherein the control electrode of the first switching means is connected on the one hand via a first resistor to one side of its switching path and on the other hand via a second resistor and the switching path of the second switching means to that side of the voltage divider which is arranged to be connectable to the other terminal of the unidirectional voltage source, and the control electrode of the second switching means is connected on the one hand to an intermediate point of the voltage divider and on the other hand via a feedback resistor to the other side of the switching path of the first switching means.

According to a preferred embodiment of the invention the switching means are transistors, preferably junction transistors.

It can be seen that a circuit arrangement according to the present invention can be used, interposed between a voltage source and a device, so that the supply voltage is not connected through to the electrical device until the supply voltage has exceeded a predetermined threshold value at which all the component parts and assemblies of the device can operate normally.

The threshold is determined by the preset dividing ratio of the voltage divider.

The circuit arrangement of the invention therefore acts as a shaping arrangement as it converts a slowly rising, or falling, switching edge into a much steeper edge, when the edge passes through a predetermined threshold.

In a similar manner, when the supply voltage falls to a predetermined threshold value for example, that at which isolated component parts and assemblies will already be ceasing to operate normally the supply voltage for the electrical device is suddenly switched off. In this way irregular operation of individual component parts and assemblies of the device being supplied, is avoided.

For a better understanding of the invention and to show how the same may be carried into effect, reference will now be made, by way of example, to the accompanying drawing, which is a circuit diagram of a shaping arrangement according to the invention. A mains transformer has a primary winding 2 connected to the mains voltage by way of terminals 3. Connected to the secondary winding 4 is a full-wave rectifier 5 which supplies a positive voltage at its connecting point 6 and a negative voltage at its connecting point 7. A capacitor 8 connected across the connecting points 6 and 7 serves to smooth the rippled unidirectional voltage. The positive unidirectional voltage pole 6 is connected in a manner known *per se* to the input of a voltage regulator 10 by way of a transistor 9. Hence, a unidirectional voltage regulated to a constant value can be taken from the

output terminals 11 and 12.

The base of the transistor 9 is both connected to its emitter through a resistor 13, and to some reference voltage level OV (or to the negative pole of the voltage source) through a resistor 14 and the connector-emitter path of a further transistor 15. The base of the transistor 15 is connected to a tap 16 of a voltage divider which consists of the two resistors 17 and 18 and to which the positive output voltage of the rectifier arrangement 5 is applied. In addition, the base of the switching transistor 15 is connected to the collector of the transistor 9 through a feedback resistor 19.

When the mains voltage is applied to the arrangement illustrated, the unidirectional voltage at the terminals 6 and 7 rises exponentially owing to the smoothing capacitor 8. When a voltage preset by the voltage divider 17, 18 is reached, the transistor 15 turns "on". Consequently, current is drawn through the voltage divider consisting of the resistors 13 and 14 and through the collector-emitter path of the transitor 15 to OV and hence the transistor 9 is turned "on". The regulator 10 then receives current, and a unidirectional voltage which is regulated to constant value appears across the output terminals 11 and 12. When the transistor 9 is turned "on", a current also flows from the collector of the transistor 9 through the feedback resistor 19 into the base of the transistor 15. Due to this feedback, the transistor 15 is turned on rapidly when it reaches its response value, so that a steeper switching edge is obtained both for the transistor 15 and for the transistor 9. The additional current flowing through the base of the transistor 15 keeps the latter stable in its "on" condition.

When the main voltage falls, the "on" condition is still maintained owing to the feedback through the resistor 19. When the supply voltage falls below the minimum necessary to render the transistor 15 conductive, as determined by the preset values of the resistances 17, 18, the transistor 15 begins to turn "off", and the transistor 9 is thus also turned "off". The feedback is interrupted and the arrangement changes over into the stable "off" condition.

It will be seen that a shaping arrangement according to the invention can interrupt its unidirectional-voltage output acurately and rapidly as soon as the mains voltage supply falls below the preset limit value. Means may be provided on either voltage divider whereby resistance values may be altered to set this limit value. Such a means is not explicitly shown in the diagram.

WHAT WE CLAIM IS:

1. A circuit arrangement for interposing between a unidirectional voltage source and an electrical device to be supplied with current, the circuit comprising first and second switching means and a voltage divider, arranged so that the switching path of the first switching means is connectable in series in the line between one terminal of the unidirectional voltage source and the electrical device to be supplied, and the voltage divider is connectable across the two terminals of the unidirectional voltage source, wherein the control electrode of the first switching means is connected on the one hand via a first resistor to one side of its switching path and on the other hand via a second resistor and the switching path of the second switching means to that side of the voltage divider which is arranged to be connectable to the other terminal of the unidirectional voltage source, and the control electrode of the second switching means is connected on the one hand to an intermediate point of the voltage divider and on the other hand via a feedback resistor to the other side of the switching path of the first switching means.

2. An arrangement according to claim 1 wherein said first and second switching means are transistors.

3. An arrangement according to claim 2 wherein said transistors are junction transistors having three electrodes the switching path of each being between the emitter and collector electrodes, and the control electrode being the base electrode.

4. An arrangement according to claim 3, wherein said one side of the switching path is the emitter electrode of the first switching means and wherein the switching path of the second switching means is connected to the base electrode of the first switching means by way of its collector electrode.

5. An arrangement according to claim 3 or 4, wherein said first switching means is a junction transistor of pnp type, and said second switching means is a junction transistor of npn type.

6. An arrangement according to any one of the preceding claims in operable combination with a power supply having transforming, rectifying and smoothing means, the switching path of the first switching means being connected to one output of the power supply.

7. An arrangement according to claim 6, when appended to claim 5 wherein said one output is the positive pole of the power supply.

8. A power supply arrangement substantially as hereinbefore described with reference to the accompanying drawing.

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1 SHEET *This drawing is a reproduction of the Original on a reduced scale*